PCAS 21 (2018/2019)

Supervised Project Report (ANTA604)

Antarctic Education Resource Project

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Abstract (ca. 200 words):

This report looks at identifying, mapping and communicating Antarctic education resources to the school community. The target audience are students and teachers and the objective is to make the content easier to access by the teachers while making the students connect with the topics.

The research involved looking at the New Zealand Curriculum across levels and years and identifying areas where existing Antarctic education resources could be mapped to. The initial resources mapped were from the Antarctica New Zealand website, Antarctica NZ Digital Asset Manager (A.D.A.M), LEARNZ , the International Antarctic Centre , some resources created by individual teachers and lastly some important third party websites. From a comparison standpoint, the Australian Curriculum and the content mapping for Australia was looked at.

The study looks at the Instructional Design angle as well since the content being communicated includes Science and related aspects, which are research based. Sample activity sheets and a website mock-up/design were then created to showcase how content on Antarctica could be effectively delivered. Also, from a project standpoint, some cost indicators have been included for the implementation phase.

The final output is in the form of a spreadsheet for mapped content and a website mock-up with activity sheets. The impact of the study can be assessed during the implementation phase and see if there is an increase in the access and use of Antarctic education resources.

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1. Introduction

Antarctica brings a mix of visuals and experiences to youngsters. It ranges from penguins and seals to oceans and ice. The scientific facets of Antarctica need to be communicated to young aspirants who want to be explorers and scientists intending to create an impact. But as we go down age groups, there is a need to create cross-curricular content, which cuts across subjects and areas. More importantly, the requirement of a 'resource base', which makes it easy for teachers (and students) to access education material on Antarctica.

The scope of the project was defined as follows:
"To scope the Educational Resource Project: Research and record educational resource existence and copyright. Determine the best method for collation, where the resources will be hosted and how much a platform will cost. Determine the length of time it will take to collate all the resources and upload them to the chosen platform."

This was then broken down into 3 phases (of which the first two phases were stated within the given scope and time frame).

Phase 1

1. Research NZ Antarctic educational resources
2. Create a comprehensive record (spreadsheet)
3. Identify the best way to collate the content.
4. Time Frame to collate/upload

Phase 2

1. Link/Collect/download resources
2. Create a user-focused taxonomy for all resources on one platform (if not A.D.A.M).
3. Include descriptions / copyrights
4. Costs involved in setting up the site/resources.

Phase 3

1. Sample layout/structure which will help create a Mock-Up
2. Ensure to make the site responsive and user centric

2. Research

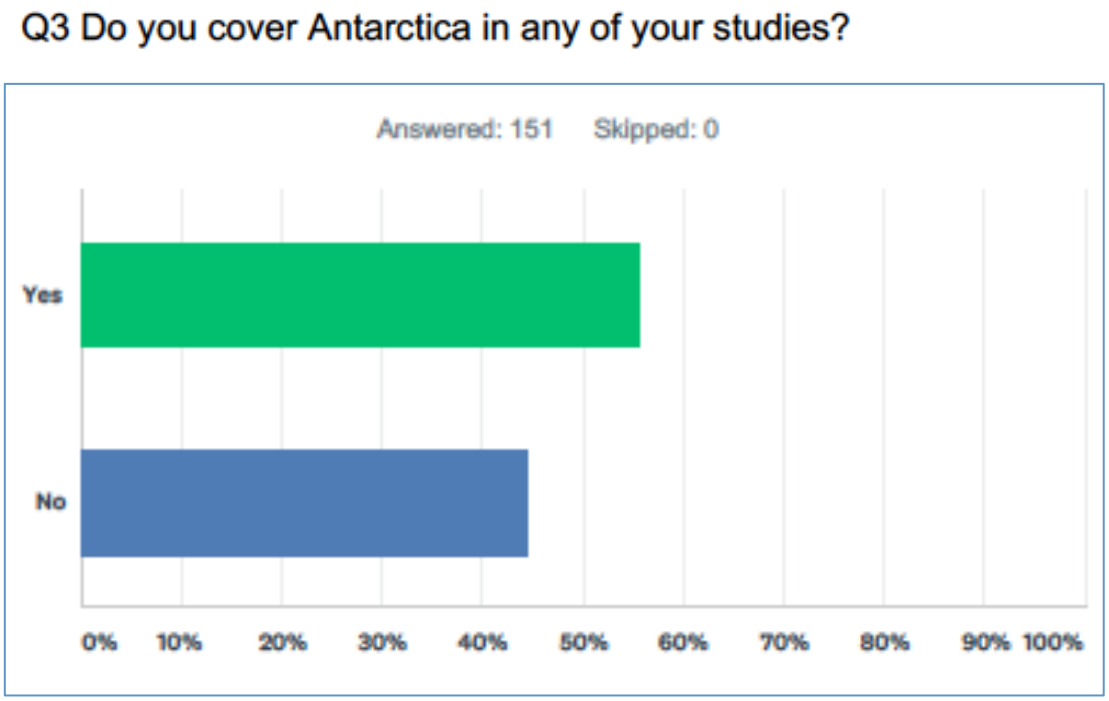
The areas that needed to be looked at were broadly in the areas of content, pedagogy, learning and innovation, and technology. Going through various past reports as well surveys conducted in the recent past was followed up with discussions with stakeholders.

The following sources (reports) were looked at

- The New Zealand Curriculum
- 'Digital Technologies in Schools' report by Research New Zealand
- 'Leading Innovative Learning in New Zealand Schools' report
- Education Strategy for Antarctica New Zealand from CORE Education
- Google Trends
- Survey by Antarctica New Zealand (for teachers) – Oct 2018

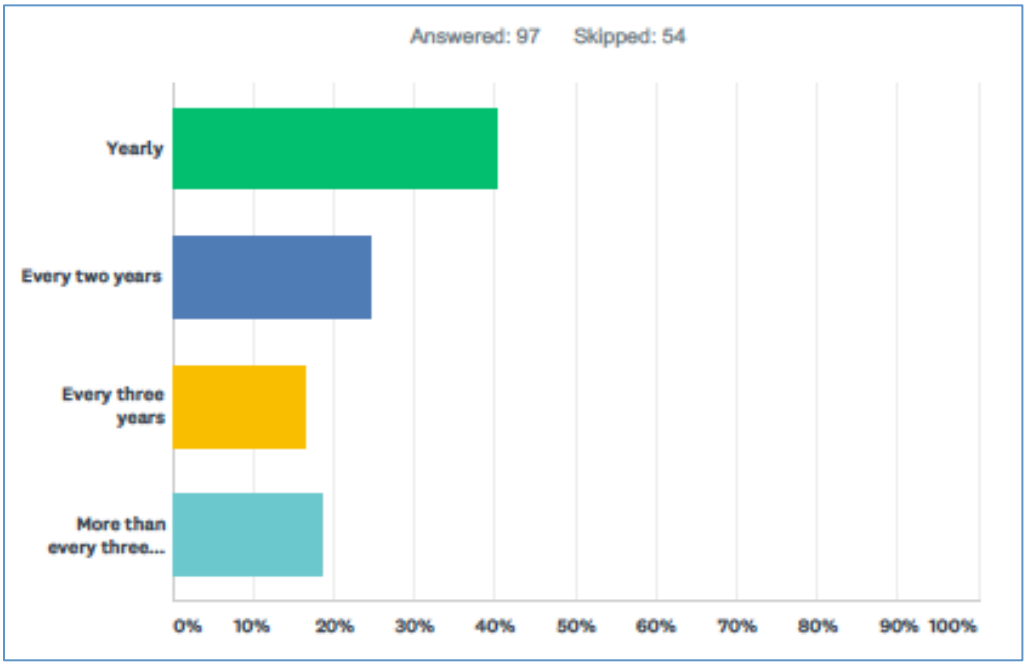
There were discussions with various stakeholders from Antarctica New Zealand, Educators, The International Antarctic Centre, as well people who had contributed to creating educational resources on Antarctica.

There were two significant questions from the survey conducted on educators (teachers) by Antarctica New Zealand that stood out. Firstly, only 55% of the 151 respondents covered Antarctica in their studies.



Secondly, of those covering the topic, the frequency with which it was covered was hardly encouraging at barely once a year (of the positive respondents).

Q5 If yes, what frequency do you cover Antarctica in your studies?



A closer look at some of the subjective questions showed the following common responses:

What are the barriers that prevent you teaching about Antarctica?
These were either limited resources or too much curriculum to cover.

What are the barriers that prevent you teaching about Antarctica?
This again boiled down to "good resources" or resources "mapped to curriculum"

What type of learning resources about Antarctica would be best for you/your students?
There were two types of responses – one leaning towards online/videos and the other towards hands-on/activity based.

These give a good idea on the way forward:
The need to map Antarctica related resources/content to the Antarctic curriculum and a combination of video and activities that could be used in the classroom effectively.

a. Antarctic Education Resources

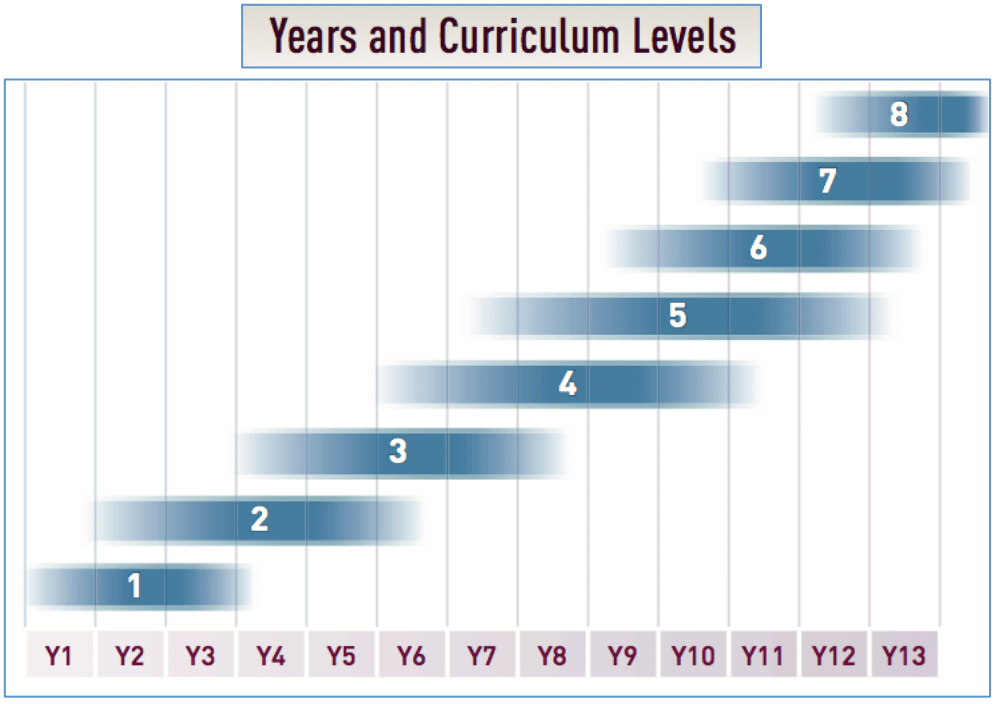
Initially, various websites were looked at (as shown below) but the starting point would be that of Antarctica New Zealand and related websites and slowly start looking at other resources.

S. No.	Source	Link
1	Antarctica New Zealand	http://www.antarcticanz.govt.nz/education/
2	Antarctica New Zealand Digital Asset Manager	https://adam.antarcticanz.govt.nz/
3	LEARNZ virtual field trips	http://www.learnz.org.nz/antarctica154/curriculum
4	Antarctic Heritage Trust	https://nzaht.org/inspiring-explorers/educational-resources
5	Discovering Antarctica	https://discoveringantarctica.org.uk/for-teachers/a-changing-climate-teachers-notes/
6	Australian Antarctic Division	http://www.antarctica.gov.au/about-antarctica/education-resources
7	Classroom Antarctica (Australian Antarctic Division)	https://classroom.antarctica.gov.au
8	Science Learning Hub	https://www.sciencelearn.org.nz/resources/328-antarctica-literacy-learning-links
9	GNS Science	https://www.gns.cri.nz/Home/Learning/Lesson-Plans
10	Education Review Office	https://www.ero.govt.nz/review-reports/antarctica-early-learning-school-05-05-2016/
11	Geography New Zealand	http://www.nzgs.co.nz/teachers-resources/antarctica-resources
12	International Antarctic Centre	https://www.iceberg.co.nz/our-experiences/education-programmes/
13	New Zealand Science Teacher	http://nzscienceteacher.co.nz/science-education-society/to-the-ice/#.XAXzJWQzaMI
14	Going to Antarctica	http://kiwikids2antarctica.blogspot.com/
15	National Geographic	https://www.nationalgeographic.org/encyclopedia/antarctica/
16	Cool Antarctica	https://www.coolantarctica.com/
17	Google Arts and Culture	https://artsandculture.google.com/exhibit/ZwJy9AwZvUY6Lw
18	Antarctic Street View	https://www.citylab.com/life/2012/07/visit-antarctica-google-street-view/2621/
19	The Antarctic Report	https://www.antarcticreport.com/
20	Antarctic teaching resources	https://www.theguardian.com/teacher-network/teacher-blog/2013/dec/15/antarctica-teaching-resources

b. Curriculum

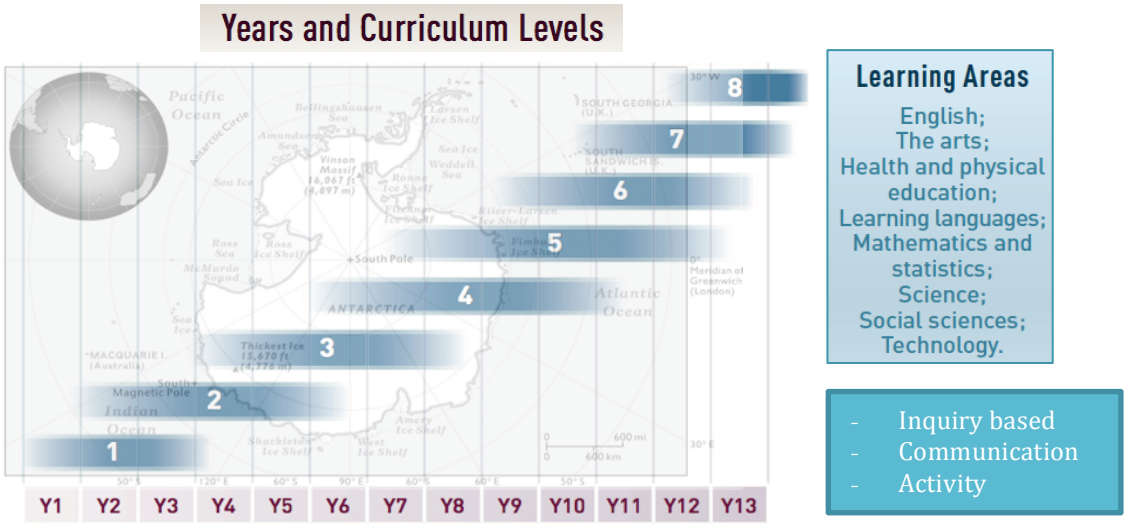
The New Zealand Curriculum has two aspects that needed to be looked into. One is the framework (as depicted in the image below) that serves as a guideline for knowing values, subjects and competencies.

The second is the years and curriculum levels to which the topics need to be mapped on to.



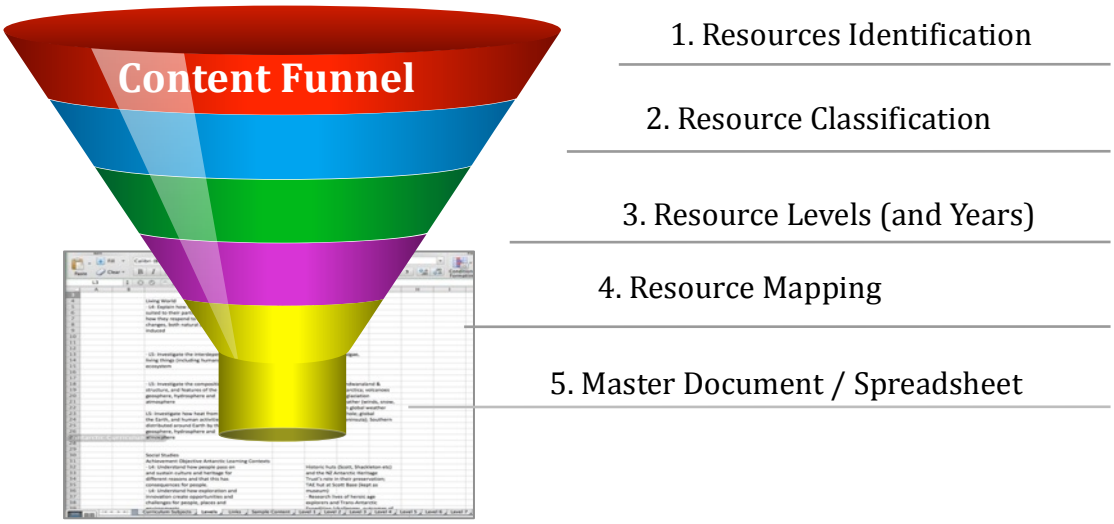
c. Subject Mapping

Keeping the framework in mind, the topics in Antarctica needed to be mapped or tagged at a subject and learning level.



[It's also interesting to note that 3 important aspects namely inquiry based learning, communication based learning and activity based learning seemed to cut across the Maori curriculum as well].

The topics identified were tagged and eventually compiled into a spread-sheet (Excel file).



The spread-sheet serves as the master document (database) into which any new content can be added/mapped. The unique code used could indicate Level>Year>Lesson or Level>Year>Topic indicated. So a L5Y9L1 would mean a Leevl 5, Year 9 and Lesson 1.

S. No	Code	Level	Year	Topic	Description	Eng	Art	PE	Lang	Math	Sci	So Sci.	Tech	Difficulty	Type
10	L5Y9L1	5	9	Gondwana	Breaking up of Gondwana land and creation of Antarctica	-	-	-	-	-	Y	Y		M	Image

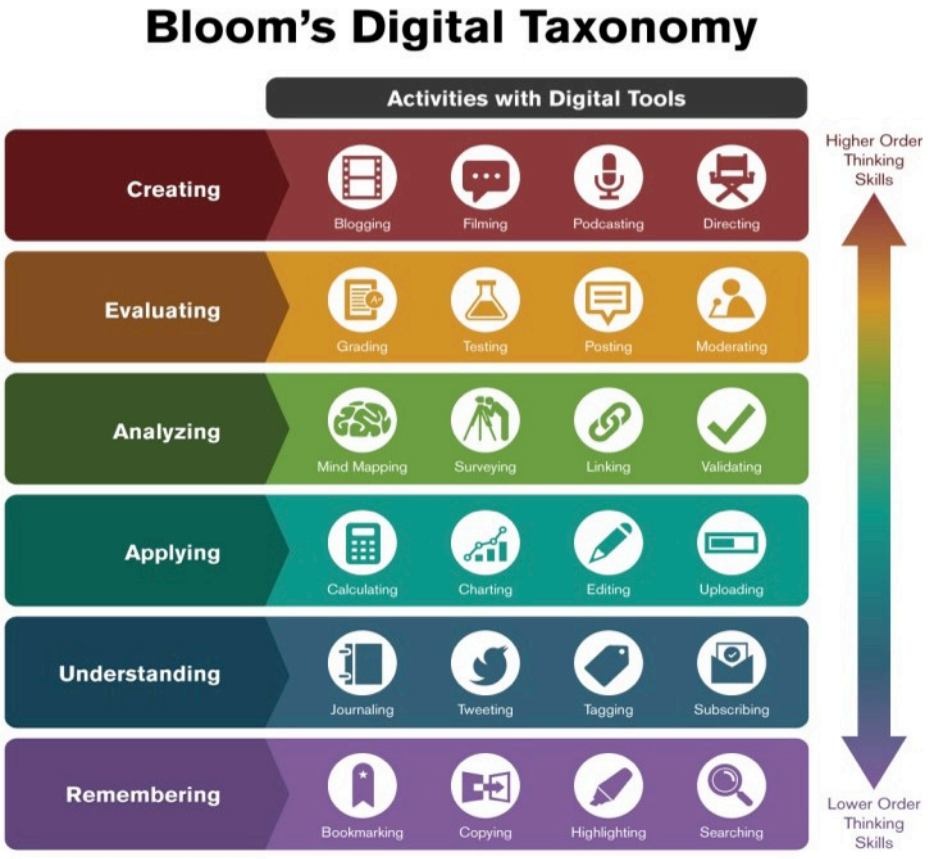
There are 3 key points to be noted:

1. Once the existing content is mapped. The form of content as showcased to user has to be identified. E.g. student gets the 'lesson' in the form of text + images + video + interactivity. The teacher also gets a lesson plan (if available) which would be a combination of the above content types. In most cases, the form of content might be similar.
2. The need to balance online content with offline [Practicality in schools]
3. Any content that cannot be categorized/fit into a year needs to go into a generic box under appropriate titles of "Videos" / "Know More" / "Trivia" / "Facts" etc.

d. Instructional Design and Lessons

It would be a good idea to take a look at the Instructional Design aspect when creating content or lesson plans.

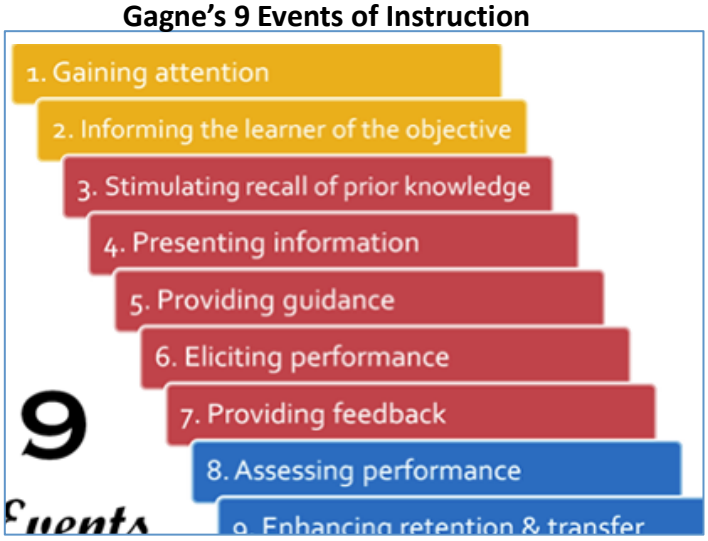
Instructional Design:
Bloom's (Digital) Taxonomy to map content and Gagne's 'Nine Events of Instruction' to sequence the information are good frameworks.



Source: Arizona State University [Info graphic Credit: Ron Carranza]

Bloom's taxonomy maps the form of content suitable for a particular learning element. So if it were a lower order thinking skill – copying or writing would work. But for a higher order thinking skill, videos or interactivity might be the way. This framework is used to strike a balance in the form of content.

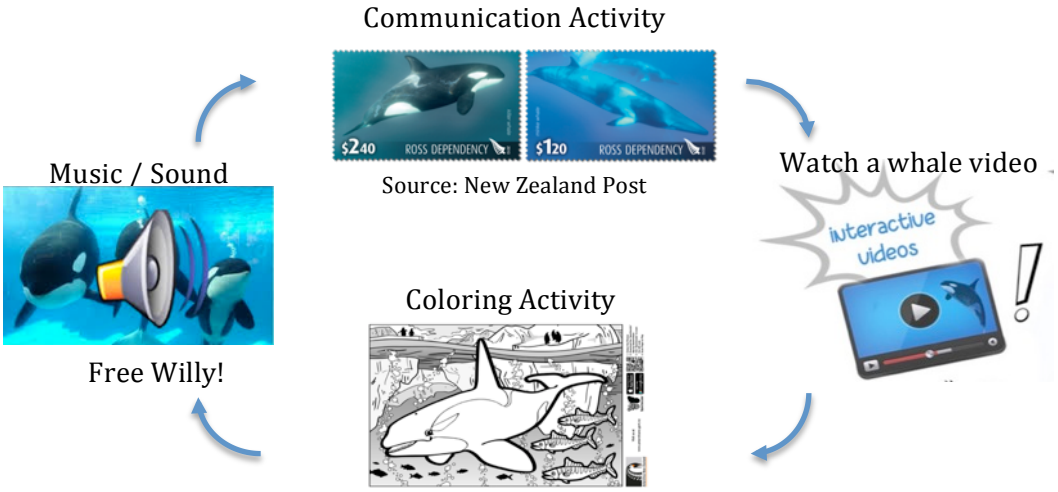
Whether it is online learning or classroom management from a delivery standpoint, the first and most important aspect according to Gagne's levels of instruction is to 'gain attention'. There needs to be a conscious effort to create a sense of interest in the first minute of introducing the topics.



Source: unt.thc.edu

Also, as we move down age groups, STEM needs to become more inclusive and become STEAM (include the Arts) and further down become STREAM (include R for Reading / wRiting). So in a nutshell, the lower levels need to be more cross-curricular and cut across subjects. This would mean including Arts and History to make learning more inclusive and holistic.

One of the ways this could be done (by making it more inclusive for the teachers as well) is to have a circular lesson plan. It's similar to a linear lesson plan, just that each part of the lesson are independent learning elements themselves. So the cross-curricular content could start with any element and end with any element as shown below.



This example shows how one can cover History, English, Science and Art using a single theme - whales (specifically Orcas in this case).

3. Content

If we look at the content available, it can be documented in terms of quantity, but that alone does not help. Volume does not necessarily mean quality and it definitely does not mean ease of use or higher frequency of use. So it needs to be measured alongside with some metrics or Key Performance Areas. (In the future, a KPI can be put in place once a couple of years of usage has been measured and we have a base figure to compare with)

a. Quantity and Metrics

If we look at the content under 'Education resources' on A.D.A.M, we have a balance of videos, text and images.

S. No	Site	Section	Resource	Quantity
1	A.D.A.M			
		LEARNZ		
			Videos	18
			Docs/Lesson Plans	16
		Antarctica Day	Videos	
		Fun Fact Friday	Videos	8
		Ice Age E-Kits	Videos	7
		Posters		8
		Nat Geo Episodes	Video Links	6
		Sid and Buck in Antarctica	Videos	6

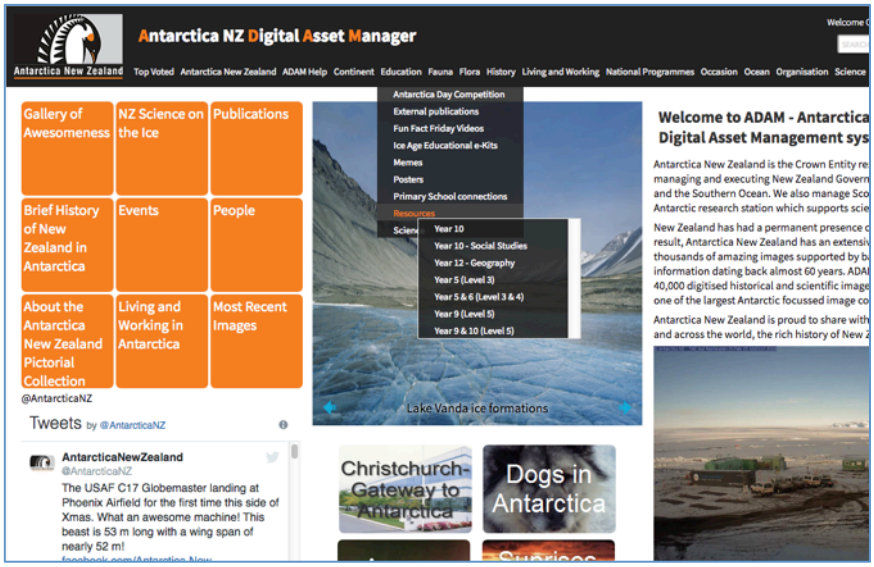
The videos covered by LEARNZ are across the following topics.

S. No	Topic	Type	Link
1	Climate Change	Video	https://adam.antarcticanz.govt.nz/nodes/view/63890
2	Putting Field Training to Test	Video	https://adam.antarcticanz.govt.nz/nodes/view/63889
3	Now your turn to become a Scientist	Video	https://adam.antarcticanz.govt.nz/nodes/view/63888
4	Antarctic Science	Video	https://adam.antarcticanz.govt.nz/nodes/view/63887
5	Scott Base behind the scenes	Video	https://adam.antarcticanz.govt.nz/nodes/view/63886
6	Travelling out to Ross Ice Shelf Camp	Video	https://adam.antarcticanz.govt.nz/nodes/view/63885
7	Ice Shelf Drilling	Video	https://adam.antarcticanz.govt.nz/nodes/view/63884
8	Antarctic Field Training	Video	https://adam.antarcticanz.govt.nz/nodes/view/63883
9	A tour around Scott Base	Video	https://adam.antarcticanz.govt.nz/nodes/view/63882
10	Arriving in Antarctica	Video	https://adam.antarcticanz.govt.nz/nodes/view/63881
11	How to fly to Antarctica	Video	https://adam.antarcticanz.govt.nz/nodes/view/63880
12	Preparing for Antarctica	Video	https://adam.antarcticanz.govt.nz/nodes/view/63879
13	Kitting out in Extreme Cold Weather gear!	Video	https://adam.antarcticanz.govt.nz/nodes/view/63878
14	Introduction	Video	https://adam.antarcticanz.govt.nz/nodes/view/63873

To ensure that these are used across subjects and levels, the mapping helps. A particular video can be wrapped around interesting lesson plans for the students to explore.

When we compare the resources available with that of the U.S curriculum (which is specific), the U.K frameworks, and the Australian Curriculum, the metrics compare would not just be the quantity, but the form of content, ease of access etc.

A screenshot below indicating the volume of information and the levels of navigation.



[Source : A.D.A.M, Antarctica New Zealand]

A more simplistic categorisation to ease user navigation.

[Source : Classroom Antarctica, Australian Antarctic Division]

b. Formats

The content is meant for all students and so the teacher might need to simplify some of the resources based on the learning levels. The content definitely appeals to students from intermediate years to high school (occasionally needing guidance from parents/teachers).

Apart from categorizing and mapping the regular content forms such as text, photos, and videos, we could look at other forms like activity sheets, flash cards, online interactivity (like hotspots, sliders) etc.

Some examples with respect to activities are showcased below.

i. Role play

Notes or flashcards could be made to describe roles of common professions found in Antarctica. E.g. the need for plumbers, drivers, electricians, mechanics etc. apart from pilots, sailors and doctors to name a few.

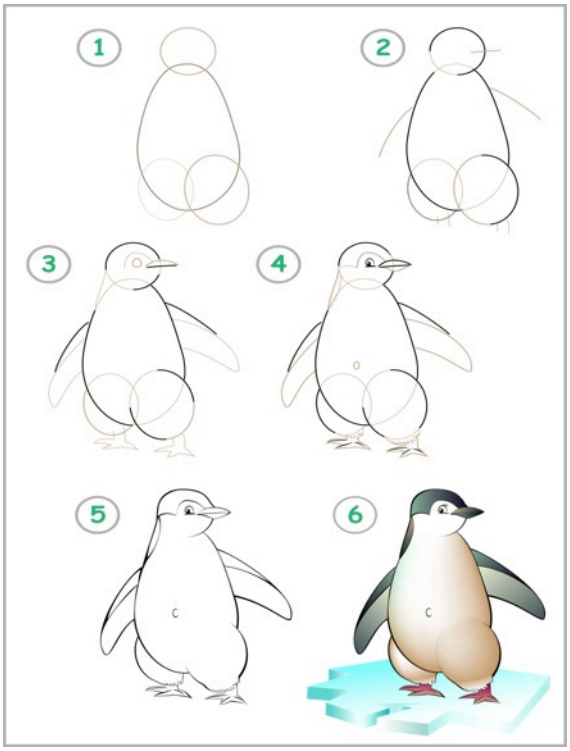
ii. Activity Sheets / Maps

The need for activity sheets and maps engage the user a lot more. These can also be mapped to learning outcomes depending on whether the subject is science or English or art. It could be objects that kids could drop on a map, learn about transport or equipment as well.

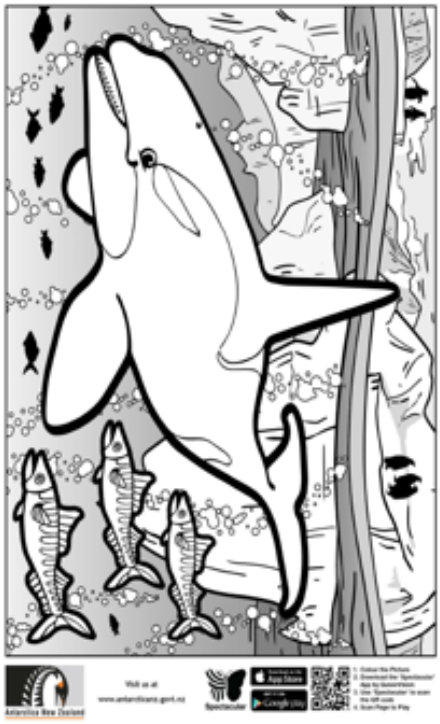
Source: 123rf.com

Source : 123rf.com

In arts class, it could be different steps to draw a penguin or coloring the orca.



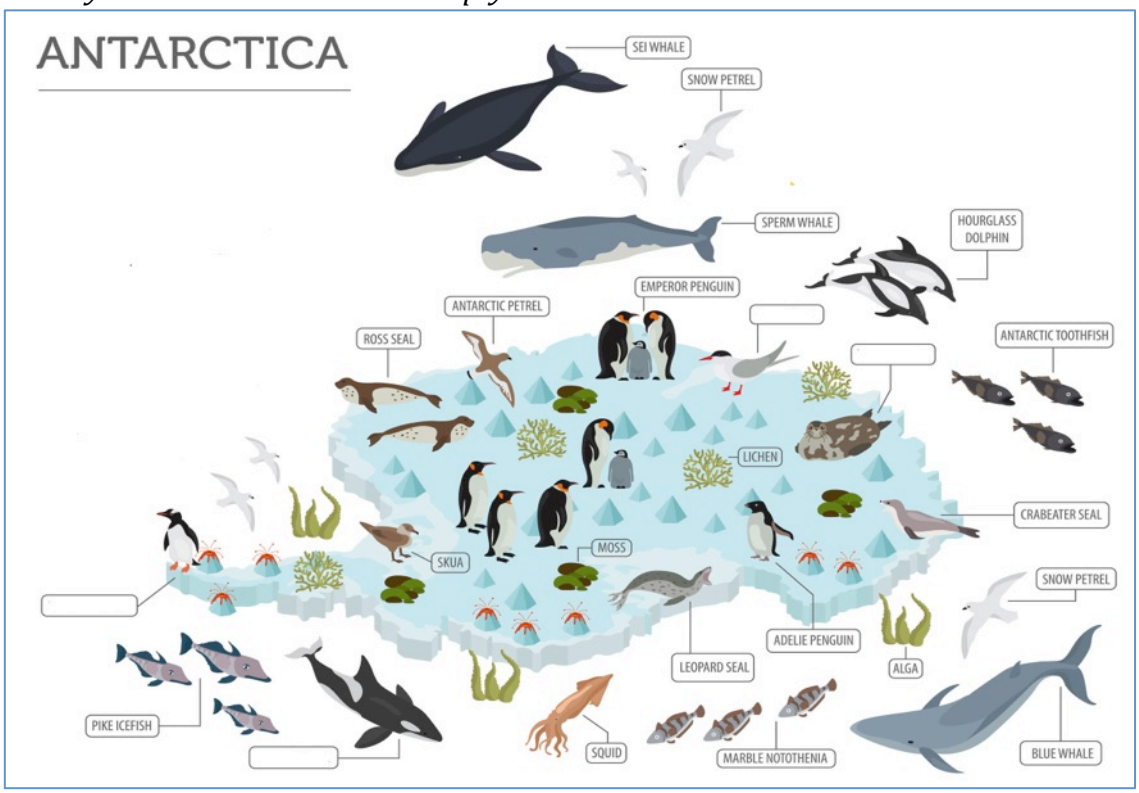
Source: 123rf.com



Source: Antarctica New Zealand

English class could involve collective nouns or spellings while science of biology could involve identifying species!

Activity: Fill in the labels in the empty boxes



Source: 123rf.com

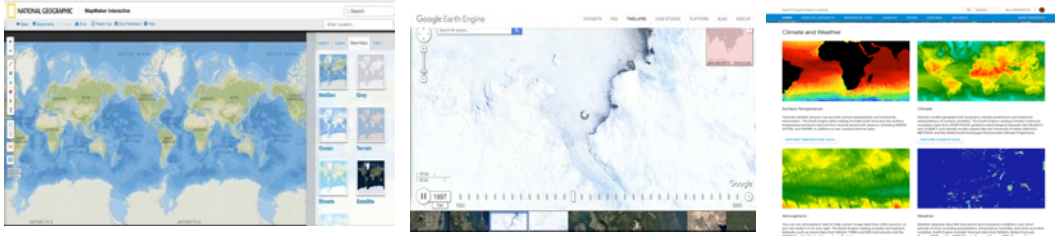
iii. Photos, project images and maps

With the growth of citizen scientists and young explorers, there has been increased awareness in the public and an appetite to absorb more information. Project sites like zooniverse provide a plethora of information. Simple exercises could be identifying the types of penguins to complex tasks of penguin counts.

Source: Alamy

As we reach higher levels, students can be informed about online tools to acclimatise them to the practical world. Additional instruction to teachers on how technology can be leveraged in the classroom helps to standardize the teaching methods too.

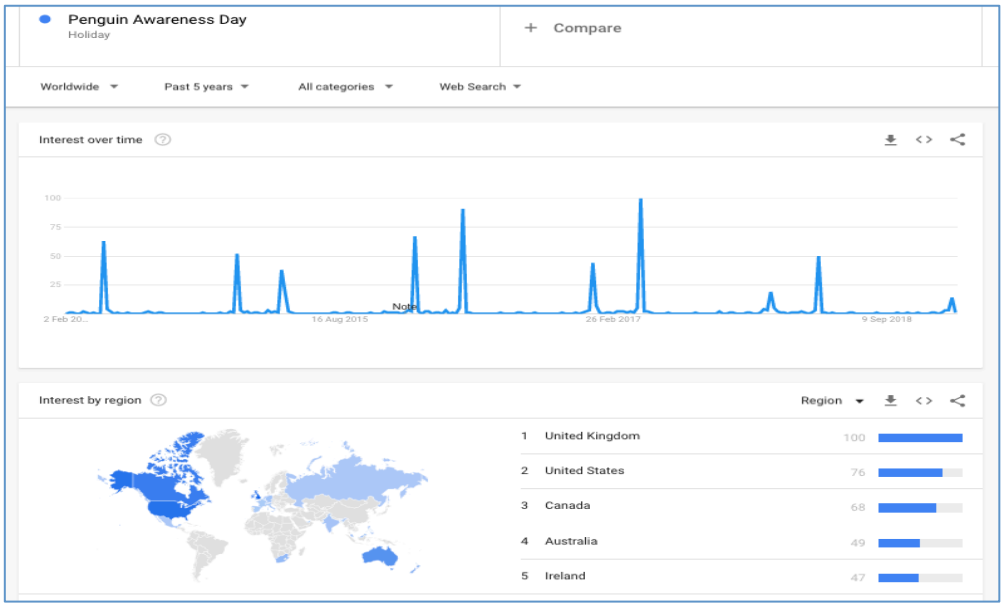
Examples of maps, time-lapses and satellite images.



Source: National Geographic Map Maker | Google Earth

iv. Activities around Important days

Some of the days such as Earth Day and Environment Day are popular all over the world. Similarly, World Oceans Day, Polar Bear Day and Penguin Awareness Day are gaining traction in different countries. A Google Trends search for Penguin Awareness Day shows the emphasis in the UK and the US.



Source : Google Trends

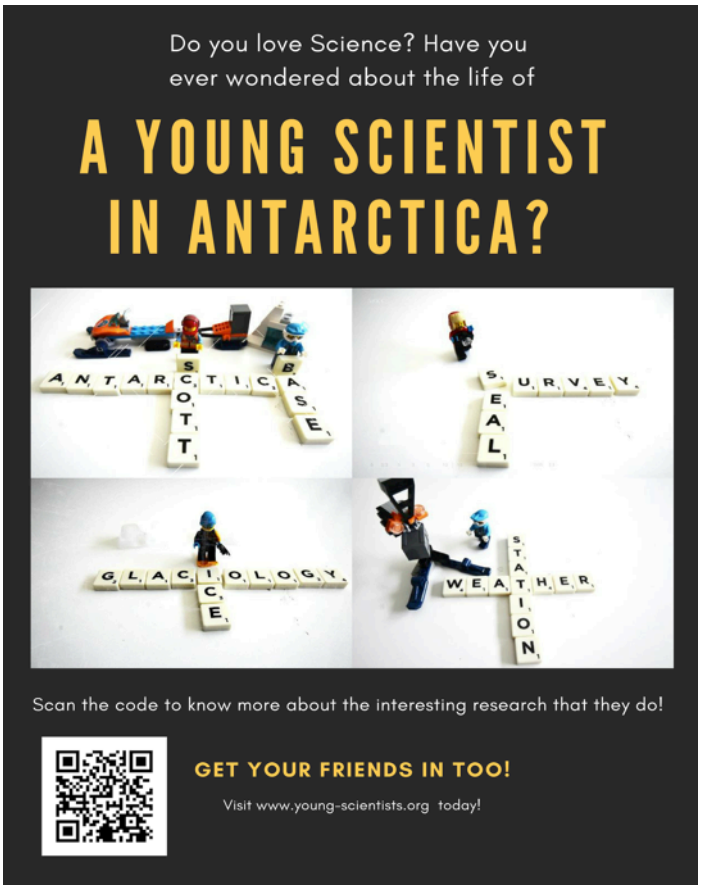
Such days including Antarctica Day that involve a New Zealand context could be leveraged upon a lot more. At a ground level, other bodies such as the Antarctic Heritage Trust, The International Antarctic Centre and Christchurch City Council (from a Gateway perspective) could be important stakeholders. Even the Air Force Museum in Christchurch has aircraft from the Trans-Antarctic Expedition.

One good example is the context of huskies. Animals build 'empathy' - which is an important value based education theme for children. A combination of The International Antarctic Centre having a few huskies on show, the Christchurch Museum having a 'Husky Exhibition' while a trip to Lyttleton and Quail Island to see sled-dog heritage provides an all-round learning environment.

c. Delivery

The microsite that the content sits on, needs to have simple navigation that eases access for teachers and students. A sample is provided at https://polarcurry.org/antarctica

There also needs to be offline communication driving people to go online. A sample was created for 'Young Scientists of Antarctica' with a poster containing a QR code led them to https://polarcurry.org/young-scientists/

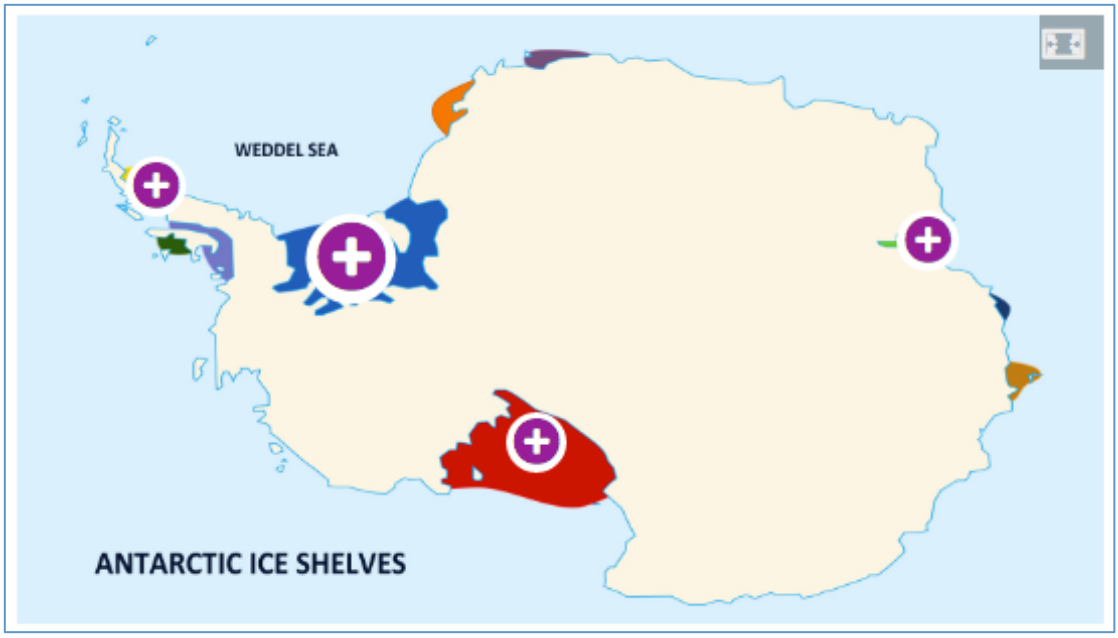


The videos seek to make the target audience more curious while offering a snapshot of Antarctic life. Quite similar to a day in the life of an Antarctic

Scientist which might aptly start with counting seals and end with getting into a sleeping bag at night. Since the topics cover a wide set of interests – photography, biologist (seals), glaciology (ice), technology (weather station) etc., it interests a wide range of serious students. Important days of the year could serve the same purpose for a lower age group.

Interactivity can be provided using plugins available to include functionality. Two popular plugins are h5p.org and genial.ly. with which we can create quizzes and flashcards to interactive videos, hotspots and sliders.

e.g. of a *hotspot* to show various ice-shelves



Created using h5p.org | Source : Wikimedia Commons

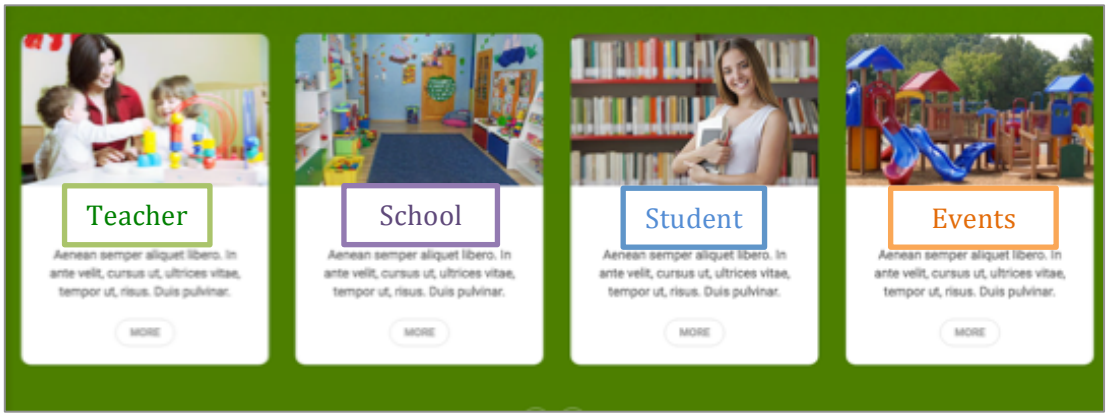
e.g. of a *slider* to show cracks in glaciers with before and after images.

Created using h5p.org | Source : NASA

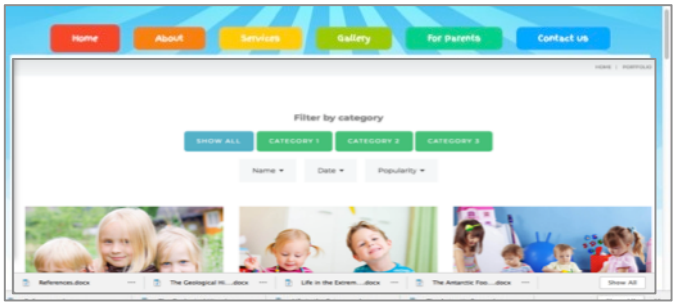
Features of the microsite (that could be emphasised upon)
1. Well curated and balanced mix of cross-curricular content
2. Diverse content in different formats - Videos, Slideshows, Blogs, Quizzes etc.
3. Responsive site across various platforms – desktop, laptop and tablets
4. Gives uninterrupted learning experience: Ad-free and safe environment for young learners to experience and enjoy.

The Road Ahead

The Home page could lead to the content pages based on type of user (If not explicitly, at least as windows when compared to A.D.A.M).



For a teacher (or a student), tag subjects clearly and be able to filter by various tags (like in ADAM, but a more user-friendly, user-centric way). Use widgets/thumbnails to present an idea about the topic covered.



Though the homepage features in a mock-up design, it is better to add the finishing touches last so elements that have been left out can be fitted in.

Timeframe and Costs

The timeframe for development of the microsite could be anything between 3-6 months. It also involves user testing from students, teachers and other stakeholders. The various stages are as follows.

S.No	Event	Time	Remarks
1	Website Design and Development	2 months	
2	Testing	1 month	After 1 is complete
3	Content Population	1 month	In sync with 2

The costs involved depend on whether the micro-site is developed in-house or outsourced. Given below are rough estimates.

S. No.	Category	Type of Overhead/Expenditure	Cost	Remarks
1	Technology	Basic Website Design and Development	3000-5000$	One time
2	Technology	Plugins / Add-ons / Subscriptions	1000$	Recurring
3	Technology	Server / Hosting / bandwidth	1000$	Recurring
4	Content	In-house and Crowd-sourced content (resource / interns)	1000$	Recurring
5.	Marketing	Parent/Teacher Workshops/Principal Forum	2000$	Recurring

*Some manpower costs are not included

4. Acknowledgements and References

Alan Zollman (2012), Learning for STEM Literacy: STEM Literacy for Learning

Boon, S (2014) What is 'science communication' you speak of? *The CSP Blog*

Robert M. Gagne Walter W. Wager Katharine C. Golas John M. Keller James D. Russell (2007), Principles of instructional design, 5th edition

LEGO® mini-figures and SCRABBLE® tiles under their fair play and fair use policy

Antarctic Education Resources : A Guide for New Zealand Teachers – Rebecca Logan (GCAS 2008)

The New Zealand Curriculum by the Ministry of Education, New Zealand

'Digital Technologies in Schools' report by Research New Zealand

'Leading Innovative Learning in New Zealand Schools' by the Education Review Office

Education Strategy for Antarctica New Zealand from CORE Education

Organizations & People
Antarctica New Zealand, Gateway Antarctica, Antarctic Society, Antarctia Heritage Trust, Christchurch Museum, Air Force Museum, Christchurch City Council